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PowerPoint Use and Misuse in Digital Innovation

Complete Research

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Abstract

PowerPoint continues to permeate the presentation genre in general and business communication in particular. Whereas PowerPoint's role in organizational practices has caught increasing research interest, research on PowerPoint in digital innovation is still scarce. This study provides comprehensive insights into PowerPoint use and misuse through an ethnographically informed field study of employee-driven innovation inside a multinational European banking software provider. Drawing on primary data consisting of 62 interviews, 41 slide decks, and longitudinal series of observations and workshops, the paper illustrates how deeply entangled PowerPoint is in digital innovation. Our in-depth analysis of PowerPoint use at different innovation process stages suggests that the tool cannot be simply regarded as beneficial or detrimental for innovation. Instead, we provide a revised dialectical examination of PowerPoint's constitutive role in digital innovation, help specify the reasons of its extensive use, and point to areas of future research in digital innovation.

Keywords: Digital Innovation, PowerPoint, Intrapreneurship, Open Innovation, New Product Development, Innovation Practices, Employee-driven Innovation

1 Introduction

With one billion PowerPoint installations and an estimated 350 PowerPoint-assisted presentations each second around the globe (Parks, 2012), PowerPoint is a predominant medium in most modern companies (Gabriel, 2008; Schoeneborn, 2013). Practitioner-oriented handbooks on using PowerPoint persuasively have become increasingly published (Abela, 2008; Berk, 2011; Duarte, 2008; Roam, 2009). The software has also encountered reception in popular culture, from humoristic comics (Adams, 2014) over 'PowerPoint Karaoke' contests and church services (Knoblauch, 2008), up to critical voices that denounce PowerPoint's negative societal impact (Garber, 2001; Parker, 2001; Tufte, 2003).

In recent years, the PowerPoint presentation and its corollaries have also become subject of academic research (Yates and Orlikowski, 2007), and a number of studies have examined the role of PowerPoint in organizational practices (Carlile, 2002; Kaplan, 2011; Ossher et al., 2010; Schoeneborn, 2013; Stark and Paravel, 2008). Most of these studies focus on the (often negative) impacts of using PowerPoint for purposes other than the intended one. For instance, Yates and Orlikowski (2007) argue that the use of PowerPoint in business communication expands beyond its initial purpose of assisting oral presentations, as the software is often applied for sharing digital documents such as project reports. This permeation of neighboring domains would often result in dissonant genre expectations. Schoeneborn's (2013) empirical inquiry into the use of PowerPoint in consulting firms reveals that PowerPoint slides are often the main (and sometimes the only) work product in project-based organizations, and that PowerPoint as constituting medium shapes both professions and organizations.

These practice-based studies relate to an ongoing IS discourse that examines the complex interrelations between material characteristics of technology-in-use and human action in organizing practices (Leonardi, 2011). It is further argued that individuals, through their use of IT in practice, create structures that shape their own emergent use of technology (Fichman et al., 2014). An emerging stream of IS studies places a stronger focus on technology-in-use to facilitate a deeper understanding of the underlying practices in which they are implicated (Orlikowski, 2007; Riemer and Johnston, 2014).

With this study, we seek to contribute to this discourse and examine PowerPoint use in digital innovation, focusing particularly on the practices of innovative employees. Thereby, this paper sheds more light on the bottom-up practices that emerge from using a technology, and contributes to a better understanding of digital innovation. We draw on the findings of an ethnographically informed field study we conducted in a major European banking software provider. Building on primary data collected from interviews with 62 experienced innovators, 41 PowerPoint slide decks, and field reports from longitudinal observations and workshops, we address the guiding research question: *How do employees use PowerPoint in digital innovation?*

The remainder of this paper is structured as follows. We start by summarizing previous studies on PowerPoint use in organizational practices, and provide an overview of the changing nature of digital innovation in today's corporate environment. We then present the research methodology applied in our ethnographically informed field study at a European banking software provider. We continue presenting the results, and illustrating PowerPoint's deep entanglement in digital innovation at the case company. We further discuss the practical and theoretical relevance of our results and set an agenda for future research.

2 Related Work

2.1 The Ubiquity of PowerPoint in Organizational Practices

Following the 1996 fatal crash of NASA's space shuttle *Columbia*, data visualization pioneer Edward Tufte kicked off a large debate on the use of PowerPoint. Columbia engineers had documented threats in a PowerPoint-based technical report, where the crucial deficit that finally caused the severe accident remained inconspicuously on the fourth sublevel of a hierarchical bullet point list. In his analysis, Tufte compares PowerPoint slides to war propaganda and blames its inexpressive bullet point logic for the disaster. He argues that the distinctive, definite, well-enforced cognitive style of PowerPoint contradicts serious thinking and actively facilitates making lightweight presentations for whitewashing weak analyses with visual aids (Tufte, 2003).

Hence not surprisingly, notable academics and practitioners often demonize PowerPoint. For instance, renowned HCI researcher Clifford Nass reported on a case where he excluded a fascinating book from a lecture, because he could not get the book into bullet points (Parker, 2001, p. 6). He concluded that PowerPoint guides people to make the point, but because it focuses only on the outcomes, it makes it more difficult to convey the process of reasoning. Of comparable prominence are the cases of well-known executives who banned PowerPoint partly or completely from their companies. To give two examples: Co-founder and former Apple CEO Steve Jobs banned PowerPoint from the product review process, because he wanted people *"to engage, to hash things out at the table, rather than show a bunch of slides. People who know what they're talking about don't need PowerPoint"* (Isaacson, 2011, p. 366). And Amazon CEO Jeff Bezos obliges employees to write a six page narrative summary to present their idea, instead of starting with a slide show (Pfeffer Merrill, 2013; Rose, 2012).

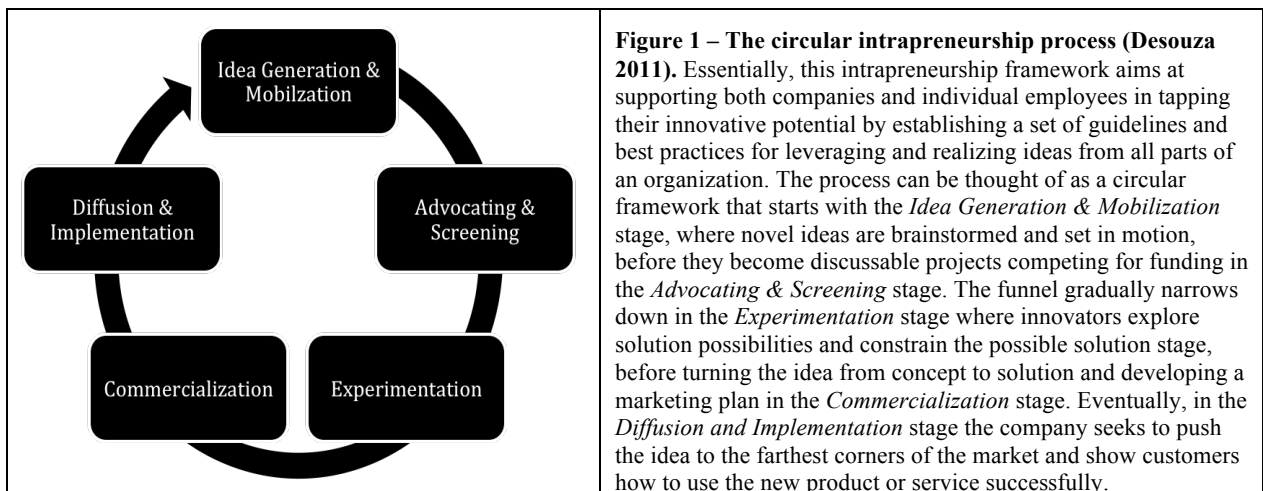
In the ongoing debate, others responded that these drawbacks should not be ascribed to the PowerPoint software itself, but rather to how it is used (Yates and Orlikowski 2007). These authors describe PowerPoint's permeation of multiple communicational genres (here: project documentation and oral

presentations) as a source of dissonant expectations and misinterpretations in organizational communication. Schoeneborn (2013) refines these theorizations by identifying subgenres and causes of this expansion. In concluding, he suggests that social phenomena such as organizations and professions are continuously evoked in and through communication and its material manifestations, and not vice versa. In this vein, PowerPoint can be seen as constituting component in organizational practices. Similar studies examine the role of PowerPoint in strategy making (Kaplan 2011), higher-level education (Gabriel 2008, Knoblauch 2008), and public demonstrations (Stark and Paravel 2008).

We see this paper into that line of studies as we examine the role of PowerPoint in digital innovation, which recently gains in importance for IS researchers and practitioners. Whereas management-oriented literature that focuses on fostering innovation within and across organizations has become increasingly popular (Kim and Mauborgne, 2005; Tidd and Bessant, 2011), and notwithstanding some first studies have mentioned in passing the use of PowerPoint in new product development (Carlile 2002), comprehensive research on the role of PowerPoint in digital innovation is scarce.

2.2 Intrapreneurship and Digital Innovation

In a corporate environment, a differentiation strategy based on product, process, or business model innovation can be a crucial source for competitive advantage (Tidd and Bessant, 2011). In the face of shrinking innovation cycles and increased competition, ever more companies seek to foster employee-driven innovation, shifting from traditionally centralized, R&D-oriented to decentralized, network-based structures (Desouza, 2011). Because R&D departments usually only enable experienced employees to work on ideas with a long-term impact, ambassadors of intrapreneurship advocate the empowerment of front-line employees to facilitate collecting ideas from all parts of an organization. Being intrapreneurial refers to employees that “share the drive and zeal of entrepreneurs”, but rely on resources provided by their organization (Desouza 2011, p. 34). They do so because they want to focus on developing ideas, but need the organization’s support when it comes to providing technology resources, skilled team partners, established partner networks and financial or legal expertise. Figure 1 summarizes Desouza’s (2011) intrapreneurship framework that built the foundation for our study.



Whereas this framework takes many IT-related case studies into account (e.g. Pixar, Google, Apple, etc.), pointing out the distinctive characteristics of digital (as opposed to non-digital) innovation is more important for our work, since these characteristics also influence the tools that are used and vice versa. Digital innovation can be defined as a “product, process, or business model that is perceived as new, requires some significant changes on the part of adopters, and is embodied in or enabled by IT.” (Fichman et al., 2014, p. 330). In a corporate context, digital innovation is an iterative, interactive, and

feedback-intensive process that requires the integration of a great variety of different kinds of stakeholders who together engage in challenging and creativity-demanding tasks (Neyer et al., 2009).

These tasks are to a high extent accomplished through the use of digital technologies, which themselves have distinctive material characteristics with important practical and theoretical implications for digital innovation (Fichman et al., 2014; Leonardi, 2011). Digital technologies radically change the nature of product and service innovations, as they provide an environment of open and flexible affordances that are used in creating innovations characterized by convergence and generativity (Yoo et al., 2012). The use of digital technologies in new product development facilitates higher degrees of digitalization of practices. In doing so, these practices (such as idea generation and development) become more tailorable, malleable, and scalable. Users can safely create unlimited perfect copies of produced objects and profit from a large variety of possibilities to share and communicate these. Through that process of digitalization, the innovation process itself inherits new properties such as increased traceability, malleability, accessibility, shareability, tailorability, and modularity (Yoo, 2010; Yoo et al., 2010). Moreover, the use of widespread technologies (such as PowerPoint) in digital innovation lets innovators profit from network economics (Fichman et al., 2014).

Whereas a high-level, top-down perspective on innovation is predominant in most existing studies on innovation, it has been argued that these new forms of digital innovation require a deeper understanding of the bottom-up emerging social practices (Andersen, 2008; Ciriello et al., 2014; Tuomi, 2002). Accordingly, an emerging stream of research argues that digital artifacts can play an active role which needs to be unpacked to better understand them in the context of their use practice and thereby obtain a deeper understanding of the underlying domain (Carlile, 2002; Levina and Vaast, 2005; Nicolini et al., 2012; Riemer and Johnston, 2014). Thus, our study examines PowerPoint use in digital innovation to shed more light on this increasingly important domain.

3 Research Design

To the best of our knowledge, no other study has examined how employees use PowerPoint in digital innovation. Hence, exploratory research is appropriate to meet our research goal. Exploratory field studies help to discover and describe unexplained phenomena, their corollaries, and the contexts in which they manifest themselves (Stebbins, 2001). More specifically, this section gives insights into our ethnographically informed field study on PowerPoint use in digital innovation inside a European banking software provider. In an ethnographically informed study, researchers inquire a particular phenomenon delimited in time and space without discounting any features of practice *a priori* (Robinson et al., 2007). We focus on a single company to examine day-to-day practices in depth (Dougherty and Baum, 2002).

3.1 Case Selection

We were looking for a company with a strategic focus on innovation and turned to a European banking software and financial service provider. Founded in the 1990s, the company (in the following termed BITS – Banking and IT Solutions) rapidly grew to an international market leader in the banking software sector, until 2008's financial crisis increased the pressure to innovate and diversify its solution portfolio. Against this backdrop, the company initiated a series of efforts to establish an innovation management framework. In the following years, the strategic focus of BITS became the development of new products and services such as a mobile banking suite, customization tools for BITS products, and a business process outsourcing offering. In the course of this endeavor, a customized form of the innovation process proposed by Desouza (2011, cf. Figure 1) was established as a conceptual foundation. The overall goal of the research collaboration is to increase the innovative capacity of BITS through improved organizational design and better IT support of the innovation practices. This study was designed to obtain a deeper understanding of the technologies that are used

in digital innovation, and how they mediate and transform interactions between innovative employees.

3.2 Data Collection

A team of four researchers gathered, analyzed and interpreted the dataset presented and discussed in this paper in an 18-month ethnographically informed field study of digital innovation at BITS. One author engaged in recent innovation projects at BITS as an *embedded researcher* to examine the actual innovation practices. In contrast to an outside observer, an embedded researcher can manage to not only fuse different theoretical perspectives, but also develop a richer understanding of the domain by learning about the problem in context directly and experiencing issues of practice first hand (Wickson et al. 2006). The author cooperated with the project teams on both planning and engineering tasks in order to document in detail the professionals' practices in the context of their daily work environment. This included participating in internal meetings and workshops (e.g. Sprint Planning and Daily Scrum meetings), as well as taking part in other formal and informal gatherings, from lunches and impromptu meetings over presentations (e.g. tech talks and prototype demonstrations) to idea fairs. Where possible, the observations were complemented with photographs and field reports.

In addition, the author conducted semi-structured interviews ($n = 62$) ranging from 19 to 100 minutes duration (average 56.9 minutes, median 56 minutes) with 18 middle managers (program/project/department manager with staff responsibilities), 15 software engineers, 8 technical leads (software/system architect, head of development team), 6 business analysts, 4 product managers, 3 consultants, 3 external partners, 2 technical writers, 2 marketing managers, and 1 executive¹. BITS executives helped us with identifying a key set of interview partners that were involved with digital innovation initiatives of the company. From the initial interviews we expanded our network following the discussions to identify further interview partners. Each interview started with questions regarding the person's educational background, previous working experience, and recent role at BITS, where the participants also described their daily work environment in terms of how they collaborate with whom and over what technologies. We continued asking them to precisely describe concrete situations where communication about innovative ideas took place over IT, and whether they perceived the technology as successful or unsuccessful medium of interaction and collaboration. During these interviews, the participants generally described common practices at various stages of the innovation process (cf. Figure 1) and around concrete digital technologies, such as PowerPoint. Where possible, the interviewees provided us with the slides. We wrote down the detailed interview notes within one day.

3.3 Data Analysis and Interpretation

We carried out the sense making collaboratively relying mostly on qualitative data analyses over interview transcripts, collected slides, and field reports. We met in a group of four researchers in weekly focus groups (Krueger, 2009) to maintain a critical distance of the embedded researcher with the case company (Wickson et al., 2006), moving back and forth between data and theories, interrogating field material to check whether emerging claims were supported by the data and, conversely, whether theories helped us making sense of the empirics (Yanow and Schwartz-Shea, 2013). The interviews were recorded and transcribed following a denaturalized approach (Weston et al., 2001), which focuses on meanings rather than on accents of the interviewees. We crosschecked the transcriptions among the research team to increase internal validity, and analyzed the cases for discrepant evidence (Weston et al. 2001). The transcriptions were imported into MAXQDA to

¹ Organizational roles are simplified and subsumed (e.g. we excluded titles such as „junior“ software engineer or „senior“ consultant) for confidentiality and clarity reasons.

facilitate joint analysis and increase confidence in the findings, where two researchers developed a codebook (DeCuir-Gunby et al., 2011). Two additional researchers carried out coding checks to ensure intercoder reliability and develop a shared conception of reflection (Weston et al., 2001). We further elaborated the codebook in weekly focus groups to identify themes from various interviews and derive new codes in vivo from the data (DeCuir-Gunby et al., 2011). The coded units were phrases, sentences, or paragraphs (Weber, 1990). We relied on guidelines for case-based theory building (Eisenhardt, 1989), and particularly on genre analysis to classify the collected PowerPoint artifacts in the context of their use practices.

Genres, such as PowerPoint, serve as socially recognized types of communicative action that shape social practices and, over time, organizing structures through their routinization in everyday work (Yates and Orlikowski, 2007). In a particular domain, such as digital innovation, genre analysis facilitates understanding the epistemic practices that produce outcomes, and has analytic advantages over the examination of PowerPoint as cultural artifact (Kaplan, 2011), because “in identifying and labelling genres we try to capture the gestalt of the various components of the communicative act” (Kwasnik & Crowston 2005, p. 80). Hence, taking a genre-in-use perspective should shed more light not just on the PowerPoint software as IT artifact and the documents it produces themselves, but more importantly on what role they play in innovation practices, and particularly on how they get mobilized by innovators and mediate interactions between them (Kaplan, 2011). We classified genres as communicational aspects about the purpose (why) and the form (how something is communicated) as well as the content (what), the participants (who), the time (when), and the place (where) (Yates and Orlikowski, 2007). In doing so, we were able to distinguish the various modes in which PowerPoint was used throughout the innovation practices at BITS. Consequently, we could clearly describe the different use practices of PowerPoint, as the structure of the following section illustrates.

4 Results

The goal of this study was to capture detailed insights into the way employees use information technologies in digital innovation. The crucial observation that triggered the in-depth analysis of PowerPoint was simply that no other tool was so predominantly used at all innovation process stages. Despite the availability of many tools that are intended to support digital innovation, PowerPoint remained the tool of choice in many encounters. This section illustrates PowerPoint’s deep entanglement in the innovation practices at BITS. We use the intrapreneurship framework by Desouza (2011, Figure 1) to structure our findings.

4.1 PowerPoint Use in Generating and Mobilizing Ideas

Our inquiry of PowerPoint use in digital innovation begins at the point where a creative spark leaps across the minds of employees. From studying BITS we learned that creativity and collaborative brainstorming characterize the *Idea Generation & Mobilization* stage, where nascent ideas are set in motion. In this earliest phase of the innovation process, people often make use of instruments that help them structure their thoughts and explain the idea to their peers in order to collect feedback from them. A typical challenge in this stage is to formulate a concise description of the addressed problem. Here, employees use PowerPoint as individual and collaborative brainstorming instrument, and for visualizing the idea to relevant stakeholders to collect feedback. The PowerPoint slides at this stage typically contain mind maps and simple boxes and arrows diagrams. For instance, a product manager emphasizes PowerPoint’s flexibility for unrestricted free-form modeling. Contrary to specialized modeling tools, which enforce a predefined syntax, PowerPoint allows expressing ideas more freely, as the following quote shows: “*Every now and then, I open PowerPoint and simply draw for myself. I illustrate my creative process in there, and when I get the impression that something interesting comes out, I present it directly and discuss it further. That can for example be an architectural model or a*

process model when I want to improve a process, it can also be a mockup when it's about usability."
[Quotation from interviewee 16, further i16, Product Manager]

Other interviewees also appreciate that, once the idea reaches a certain degree of maturity, the drawing is already presentable. That way, the innovators can quickly discuss the idea with colleagues and customers without too many intermediate steps. Similarly, a software architect reports that early ideas in her team most commonly emerge on the whiteboard first, e.g. in workshops, or impromptu discussions after a daily scrum meeting. Afterwards, those handwritten sketches are often photographed, redrawn in PowerPoint, and then put on a wiki, *"such that one can continue working on it"* [i1, Software Engineer].

In turn, a lead developer criticizes the tendency to expect presentations already at this early stage: *"The hurdle to present something is very high here, because everyone always expects high class presentations. It rarely happens that somebody says 'come and tell me what you think in a 15 minute coffee break.'"* [i6, Technical Lead] According to that interviewee, many good ideas would therefore not even come to debate, and more whiteboard discussions to sketch early ideas would be helpful.

4.2 PowerPoint use in the Screening of and Advocating for Ideas

At some point, an idea most certainly needs funding to be further pursued. Most organizations do not lack ideas, but ways to set them in motion (Desouza 2011). In the *Advocating & Screening* stage, the innovator therefore needs to go from pillar to post in order to build a social coalition of advocates and safeguard stakeholders' long-term commitment to grant necessary resources. Our interviewees' PowerPoint use in this stage includes creating persuading fund raising presentations, as well as appealing visualizations providing a high-level overview of the idea that can be reused in various contexts. Generally, these PowerPoint slides are often reused in various contexts, e.g. in a sales presentation, on the company website, and as printed poster that is hung up in the office hallways in order to remind employees of the big picture. A product owner explains how an elevator pitch should ideally be accompanied by concise slides: *"PowerPoint works well if you need money. Then, you need condensed slides. I recently learned that you already have to illustrate everything in an abstract on the first slide. Even in PowerPoint you need a management summary, because often times you don't even pass the first slide."* [i6, Technical Lead]

According to this interviewee, PowerPoint is a suitable instrument to create high-level illustrations that are universally understood in various contexts. To make an idea accessible to a broader audience, it should be kept in mind that the *"direct audience"* of such a presentation also carries the idea on to others. Hence, *"the broader the audience, the more high-level your concepts need to be, and the more likely you're on the PowerPoint level."* [i6, Technical Lead] Often times, simple boxes-and-arrows or process diagrams work best in this context, because *"if I want to sell something, I have to speak the buyer's language."* [i6] The presentations in this stage often feature a crossfade effect, where the starting slide illustrates a problem with the status quo, and on the following slide the envisaged innovation is blended in to heal a wound.

Furthermore, most interviewees explain that the high degree of reusability of appealing slides make PowerPoint an integral instrument for selling ideas: *"Once you have a nice visualization you can also reuse it e.g. in a sales presentation"* [i4, Business Analyst], a business analyst states. It is common practice that certain slides appear again and again in different contexts. For instance, a bullet-point based storyline showing how the innovation can be placed in the value chain has been reused in the homepage. One manager emphasizes how vital a visually appealing slide is. An illustrative slide can be a decisive catalyst in spreading ideas throughout the company and beyond. Especially when persuading a funding decision is intended, a good slide may decide over success or failure. Hence, when creating a persuading presentation, the interviewee reports, *"I am quite careful in its preparation, because I have learned that I am only successful when I adequately illustrate what I want"*

to achieve. [...] So when I need a decision, I create a PowerPoint, because that is just how it is done here." [i8, Middle Manager]

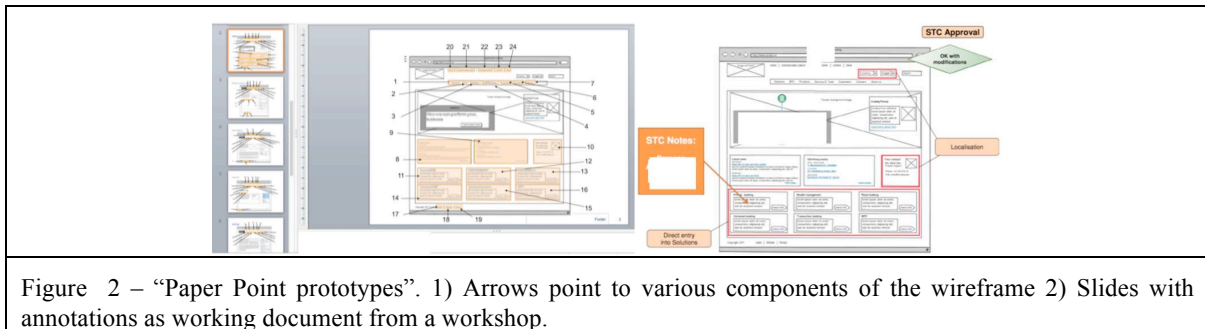
This interviewee compliments a colleague whose illustrative conceptual slides become self-selling items more often than not: *"He does not lose himself in conceptual perfectionism and stays focused on the target group. [...] It is the kind of artifact that can be presented by other people, too, and the message is still loud and clear. And then, I'd say, such a slide has more than paid off."* [i8, Middle Manager]

However, one experienced software architect warns that such visually appealing slides can also backfire. In a recent innovative project, the team was stuck with a wicked problem. So the interviewee took the vacation to program a first prototype that demonstrated how the problem could be solved. After the vacation break, the architect presented the solution with a PowerPoint presentation and it was accepted without much resistance. However, the necessary required resources envisaged by the management to complete the project was way too low. The visually appealing representation had created the false impression of an almost finished solution.

4.3 PowerPoint Use in Experimenting with Ideas

Once the necessary commitment to further pursue an idea is granted, further exploration of necessary refinements and modifications grows in importance. The *Experimentation* stage calls for artifacts that facilitate both divergence and convergence. This includes broadening up the solution space and conducting experiments in a structured way. At this stage of the innovation process, PowerPoint typically surrounds employees in workshops, where it serves as an interactive medium to explore design options and discuss possible solutions. A common practice at BITS is what we term *Paper Point prototyping*, where wireframes (i.e. rough sketches of a screen) are embedded in a presentation in order to perform a scenario walkthrough interactively with customers. One interviewee reports from an innovation partnership with a bank, where the Paper Point technique was reportedly a suitable instrument to discuss raw ideas and get an overall impression whether the envisaged system could be helpful in practice. This interviewee argues that the desired customer feedback generally *"only comes when they see it graphically in front of them"* [i1, Software Engineer], rather than from reading long software specifications.

Accordingly, many interviewees state that they regularly go back and forth between slides, flipchart, and interrogating the audience. One external partner considers it *"most efficient to show a few screenshots in PowerPoint, indicate with an arrow to what will go where, switch to a live demo and then go back to the presentation. Start with the existing situation, show roughly what you want to do and ask people if that's what they would like to have"* [i23, External Partner]. Similarly, a developer reports to prepare an illustrative scenario with a Paper Point prototype whenever possible. This interviewee regards this technique as particularly helpful when discussing ideas with customers: *"I can take screenshots of the existing application, and take wireframes where I do not have something, yet. I file both into PowerPoint and then walk the customer through it step by step. [...] This way, the customers get an impression of how the final system would look like, which is very important in that design phase, because they can tell directly when they do not need something. So when you communicate over these instruments in that phase, you benefit in two ways: You reflect upon your ideas and strike things through that lead to a bad usability. In addition, you get customer feedback immediately, and that is good quality feedback because they see directly where they're going to."* [i11, Technical Lead, cf. figure 2]



This interviewee states that it works best to distribute the slides as meeting minutes after a workshop among relevant stakeholders. This way, the receivers could easily reconstruct at any time what has been discussed in that workshop by recalling the slides from their mailboxes. Additionally, it is common practice to annotate content directly in the slides, often interactively in workshops. PowerPoint is then used to annotate certain aspects of the screens with boxes and arrows, along with further explanations in the presentation notes. One experienced business analyst, however, argues that the applicability of this technique is rather constrained to discuss incremental changes in mature projects, or where one needs to justify *“why something needs to be built”*. As the degree of novelty of a development increases, a “real” live demonstration becomes indispensable, because *“slides are not enough to convince a bank. Everyone can write slides. Generally, the customer does not decide on a slide. Of course, a prototype requires much more investment, but it also has much more persuasive power”*. [i10, Middle Manager]

4.4 PowerPoint Use in Commercializing Ideas

As the raw idea gradually takes shape, translating it into a market-ready solution with convincing benefits for end users gains in importance. In the *Commercialization* stage, the idea is typically no longer solely in control of the intrapreneurs and their initial coalitions. Rather, the whole organization takes responsibility and starts developing a marketing plan including packaging, pricing, and promotion (Desouza, 2011). When translating the idea from abstract concept to concrete solution, PowerPoint is often used to create diagrams, working papers or blueprints for further documents, such as specifications.

Here, we discovered that PowerPoint dominates the creation of all kinds of models, from use case-, activity-, sequence-, state machine-, and architecture diagrams to business process models. Whereas some interviewees strongly advocate for institutionalizing standardized modeling languages and tools, many others perceive such formalism as unnecessary chore and are satisfied with modeling in PowerPoint. Although they have profound experience with formal modeling languages and tools, specifically UML, BPMN, requirements engineering, and business process modeling, they often refuse to apply that knowledge in practice.

The innovators at BITS have very conflicting (and strong) opinions on that topic. On the one hand, many interviewees argue that standardized modeling would reduce the onboarding effort and the training cost of new employees. For example, one lead developer argues that there should be as few company specific practices as possible, and hence UML would be a predestined measure, as the following statement shows: *“Our software actually has a fantastic object model. However, it is not yet established at all to create a simple UML profile for that, such that one could use standardized tools instead of drawing lines and circles. [...] Most people still draw their diagrams with PowerPoint. An object is a circle in PowerPoint! Why not a simple UML profile with a stereotype?”* [i21, Technical Lead]

Two further interviewees concur that they insist on using modeling tools, although it is not common to do so for the rest of the company. They assume that the reason for this is that the often very expensive

tools are not seen as sufficiently beneficial, and it would be easier to model quickly in PowerPoint. Whereas the rather technical persons tend to prefer UML, people from business domains who have regular customer contact use PowerPoint more extensively. A developer complains that, this way, “you can create a picture and put it on Confluence but others cannot continue working on it.” [i30, Software Engineer] Hence, one manager regards it as “absolutely essential to create diagrams with adequate tools”, and is not appreciative of employees who “cobble together” diagrams in PowerPoint: “I have already seen PowerPoint templates for use case diagrams here. Totally off the mark, but people actually do this.” [i8, Middle Manager] In addition, one lead developer regards slides as unsuitable for documentation. Over time, it would inevitably lead to a loss of the big picture when too much is communicated via PowerPoint: “From an artifact, I generally expect that I can make sense of it without having to come back to the author. But a slide set is usually coupled to the presentation. A slide set sent by mail is insufficient. It sadly happened very often that we just received last year’s tech talk slides and should do something with them.” [i28, External Partner]

The proponents of modeling in PowerPoint counter that formal modeling notations are generally not understood by customers, and therefore those diagrams have little use because BITS typically cooperates tightly with banks. “I do not think the problem is that we cannot find the right instruments or format. We are satisfied with PowerPoint in workshops; you cannot go that deep there anyway. At the end of the day, whether you model with UML or PowerPoint does not matter at all.” [i12, Technical Lead] a system architect states. And a software architect concurs: “The first drawings are totally wrong anyway. Nobody adheres to a standardized nomenclature. The UML standard is not adhered to at all, because nobody appreciates it anyway. (Our drawings) are simply boxes and arrows, and the discussion around them is important. The drawing is just a reminder of how it was thought.” [i14, Technical Lead] Among its proponents, PowerPoint is regarded as the best available modeling tool, because it provides better flexibility and is universally understood and applicable in disparate contexts. For instance, this lead architect describes how PowerPoint facilitates constructing complex solutions step by step: “Once there is this certain degree of structuration, PowerPoint is a good medium, because one can create graphics relatively fast and simple. Over and above, one can present it like that immediately. [...] The PowerPoint slides from [a recent project] would be a positive example. One of the central elements was the object model, which we expanded extensively. [...] We could visualize the object model fairly well, and construct additions from one slide to another, whereas we started with the simplest version and build upon it step by step. We created the object model directly in PowerPoint and did not use a separate tool for that.” [i7, Technical Lead, figure 3]

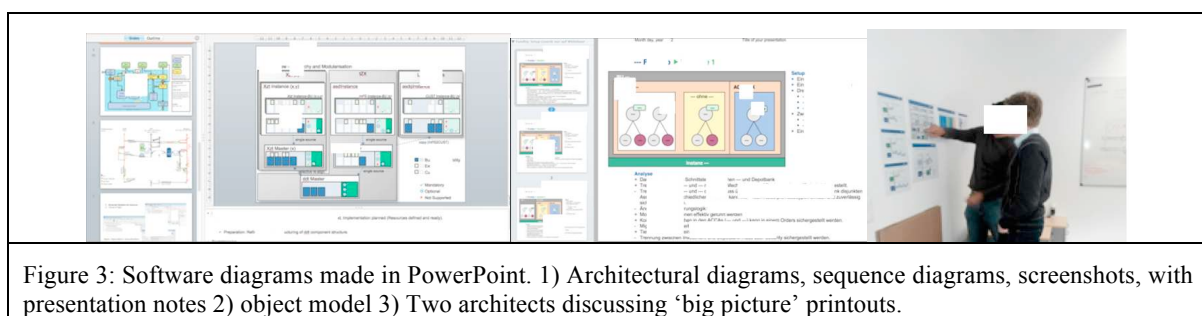


Figure 3: Software diagrams made in PowerPoint. 1) Architectural diagrams, sequence diagrams, screenshots, with presentation notes 2) object model 3) Two architects discussing ‘big picture’ printouts.

4.5 PowerPoint Use in the Implementation and Diffusion of Innovations

Finally, when a commercialization plan has been developed and the innovation is ready to be introduced to the public, the innovators have to push the idea to the farthest corners of the identified markets and help customers to use the solution successfully. Here, *Diffusion* refers to the process of generating buy-in and acceptance for the solution, whereas *Implementation* means setting up the structures, maintenance, and resources to allow it to be produced or brought into effective use

(Desouza 2011). This includes making the relevance of the innovation clear to the audiences, present it in an appealing way, and show how it can be used beneficially. At this stage, PowerPoint is commonly used to create product presentations and training documentation.

New products or modules are often presented at internal tech talks and external customer contact events to inform the audience of upcoming change programs. The internal slides usually show different screenshots of the system, along with usage instructions and additional information in the presentation notes, such as login credentials, test user environment, and code repository locations. A lead developer explains: “*We held a tech talk about (our new product) very soon to show how it can be used. [...] You have to share a benefit with the people to justify your budget*” [i21, Technical Lead]. The external slides are often shared on web platforms for documentation purposes. There, PowerPoint is commonly used to create customer documentation and training material. For example, in the Scrum development teams, it is common practice to present new features and incremental product innovations in monthly Sprint Review meetings, where stakeholders and customers participate. There, a PowerPoint slide often lists the most important aspects of the innovation, followed by a short live demo by the involved developer(s). Furthermore, the BITS business school offers certification and licensing courses for the partner network. The course material consists mainly of PowerPoint slides.

5 Discussion

In this paper we revisit the environment of open and flexible affordances (as introduced by Yoo et al. 2012) to better understand the role of digital technologies – in this case PowerPoint – and the impact of their properties on innovation practices. Our study shows how deeply entangled PowerPoint is in digital innovation at the software enterprise BITS. It accompanies people from the moment they start brainstorming ideas, structuring thoughts, and gathering feedback until the idea finally becomes a product. As our data illustrates, the distinctive morphology, malleability, and modularity of PowerPoint (e.g. linearity, parallel use of written phrases, figures and oral explanations, the limited available space in a slide) seem to fit the emerging character of digital innovation, as described by Yoo et al. (2012), quite well. Contrary to many specialized tools, PowerPoint facilitates the seamless transition between representing an idea on a slide and in the envisaged idea, for instance when complementing prototyping with UI mock-ups. However, we have also learned that PowerPoint use can run up against its limits and result in negative outcomes for innovators. We now juxtapose uses and misuses from a theoretical and practical point of view.

5.1 Theoretical Implications

Greater freedom of expression vs. inhibiting creativity

Firstly, our study reconfirms earlier theorizations that suggest IT professionals prefer media that provide them with *greater freedom of expression* over those that enforce uniformity when having to communicate ideas across intersecting social worlds (Cherubini et al. 2007). This is particularly the case when having to involve various stakeholders with different roles and educational background, and from different organizational units (Carlile 2002). However, the routinized use of PowerPoint might *inhibit more creative practices* such as free hand drawing or simply talking to each other, as criticized by interviewee 6 (section Idea Generation & Mobilization). This can be particularly detrimental when using PowerPoint to brainstorm early ideas already, and afterwards people want to stay in the same medium all the time. As earlier studies have argued, the forced linearity of a PowerPoint presentation leads to a tendency to defer questions to the end, thereby reducing the speaker’s responsiveness to the audience (Yates and Orlikowski 2007), and inhibiting fruitful discussions, improvisations, and inventiveness (Gabriel 2008).

Persuasiveness of aesthetic slides vs. overshadowing the idea's actual degree of maturity

Secondly, the *aesthetics of an illustrative PowerPoint slide* play a crucial role in *persuading* relevant stakeholders, especially if the creator manages to illustrate a clear benefit in a feasible way. For instance, the case described by the software architect (section Advocating and Screening) illustrates how a PowerPoint presentation helped to persuade managers of an idea. That same persuasiveness, however, backfired when the management overestimated the idea's degree of completion, and consequently did not grant sufficient resources. As our study further shows, the digital nature of PowerPoint documents can be a decisive catalyst in mobilizing ideas, as reflected by interviewee 8's description of how creating PowerPoint documents particularly "pays off" when people other than the author can present them. In this vein, our study reconfirms earlier theorizations that argue that PowerPoint can persuasively display facts that do not yet exist in reality (Kaplan, 2011; Stark and Paravel, 2008), which can be both beneficial and detrimental. Often times, PowerPoint presentations tend to signal a preparedness that *overshadows the idea's actual degree of maturity*. Conflicts may arise when PowerPoint presentations do not provide sufficient information on the idea's actual state per se, especially when the author is not present.

Universal business language vs. misinterpretations

Thirdly, as the PowerPoint genre and its corollaries continue to approach the status of a *universal business language* (Gabriel, 2008; Schoeneborn, 2013), PowerPoint presentations can be expected to fulfill ever more functions in a variety of practices. The universal acceptance of PowerPoint allows the IT innovators to start presenting or discussing their ideas without the necessity to establish a common understanding of the discussion format. Quite the contrary, some interviewees pointed out that PowerPoint presentations have reached a level of acceptance which resembles a social convention, as reflected by the reported subtle coercion to always present an idea with PowerPoint (section Idea Generation & Mobilization). In this vein, the innovator seems to profit from network economics (cf. section 2.2) when using PowerPoint, because a variety of stakeholders with different backgrounds can be reached. As such, our study not only offers deep insights into how employees use PowerPoint in digital innovation, but also helps explain why PowerPoint is so predominant. Due to the digital nature of PowerPoint, the drawings can be shared with others without many intermediate steps, and through a variety of digital channels, e.g. chat, mail or wikis. However, the ongoing expansion of PowerPoint's use contexts often causes *misinterpretations* that result from dissonant genre expectations (Yates and Orlikowski, 2007). For instance, PowerPoint documents that serve the dual purpose of presentations and project reports miss the information requirements of either. The Paper Point Prototyping technique has shown that the same usage pattern can be very successful in one context, and a failure in another.

5.2 Practical Implications

PowerPoint supports innovators throughout the whole innovation process. At the earliest stage, *Idea Generation & Mobilization*, PowerPoint's flexibility and freedom of expression facilitates creating simple idea visualizations and quick sketches that can be presented without many intermediate steps. In the *Advocating & Screening* stage, PowerPoint presentations play a central role in persuading funding decisions. Reportedly, the software is particularly helpful for creating illustrations for elevator pitches, management summaries and high-level conceptualizations that are hung up in the hallways and offices to remind employees of the 'big picture'. As the idea gradually takes shape in the *Experimentation* stage, innovators use PowerPoint to walk the customer through a certain scenario, using the software to complement screenshots with mockups. When the solution space gradually narrows down in the *Commercialization* stage, people create working documents, diagrams, and models that are collaboratively shared among the project team in and via PowerPoint. When the completed innovation is to be spread in the market, PowerPoint assists the *Diffusion & Implementation* in product presentations and tutorials that show how the innovation can be successfully used.

Practitioners (managing personnel, innovation managers, intrapreneurs) may use these insights to develop their own set of best practices for PowerPoint use in digital innovation, to create awareness of the opportunities and risks of using PowerPoint (flexibility and universal acceptance vs. overshadowing and genre intermixture), and to better understand the bottom-up emerging character of digital innovation. Our study explains how people can compensate the weaknesses of PowerPoint (e.g. the low formal uniformity of PowerPoint documents) with the strengths of another tool. The innovators from our study often occasionally ‘grab’ PowerPoint when a creative spark generates the need to create a quick sketch of the idea, because PowerPoint provides them with an extensive freedom of expression in a ready-to-hand way. Contrary to tools for standardized modeling languages such as UML or BPMN, which are not universally understood, PowerPoint does not prescribe narrow semantics and enables less restricted free-form modeling and drawing, and facilitates the creation of different kinds of diagrams in one tool. Our data shows that people find it easier to create appealing drawings quickly, especially when using predefined shapes and templates. In this vein, our study explains the widespread preference of PowerPoint over dedicated modeling tools. While PowerPoint provides the innovators with some flexibility and freedom of expression to generate and visualize ideas, its lack in uniformity and standardized semantics can lead to ambiguities, particularly among newcomers who are not familiar with internal conventions.

6 Conclusions and Future Work

PowerPoint continues to permeate business communication in general, and digital innovation in particular. Whereas management-oriented literature that focuses on innovation processes has become increasingly popular, and notwithstanding some first studies examined the role of objects in innovation, research on PowerPoint in digital innovation is scarce. By being part of an organization as engaged scholars (Van de Ven 2007), and doing interviews along with collecting complementary documentation, we were able to focus on how employees use PowerPoint in digital innovation. We have argued that seeing digital innovation through a PowerPoint lens facilitates a better understanding of the bottom-up emerging practices and uncovering challenges innovators face in this complex process. In doing so, we were able to provide a revised critical appraisal of PowerPoint that complements many existing studies that characterize the technology as either beneficial or detrimental. At the same time, the illustrated manifold use practices of PowerPoint contribute to a better understanding of digital innovation itself.

Similar to engineers from previous studies (Carlile, 2002; Cherubini et al., 2007), who use drawings to solidify product ideas and get feedback, our study shows how PowerPoint enables innovative employees to generate, discuss, and refine ideas. These practices also contribute to the increasing openness of innovation (Chesbrough, 2003) by facilitating the inclusion of ideas from myriad sources within and across an organization and “giving voice to people up and down the hierarchy of their organization through their production of PowerPoint documents” (Kaplan 2011, p. 344).

Our study suggests that PowerPoint should not be seen as a static part of an organization, but rather as part of innovation practices that is enacted within a larger whole. In turn, digital innovation should also be seen as a bundle of dynamic practices where PowerPoint mediates interaction to a large extent. Our examination of PowerPoint’s entanglement in digital innovation integrates well with recent discourses that focus on what happens when practices take a technology beyond the purpose of its initial use (DeSanctis and Poole, 1994; Faulkner and Runde, 2009).

This research has to be seen in the light of its limitations. To limit the complexity of our study, we focused on one single company and one particular technology. We suggest future research to put more emphasis on the use of various kinds of digital technologies to better understand their role in digital innovation, and simultaneously better understand digital innovation as the underlying domain. Future studies may observe if the illustrated use of PowerPoint is specific to software firms or applicable in other types of organizations (e.g., consulting firms or universities and research institutions).

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